

NOTES ON *PHRAGMITES AUSTRALIS*
(POACEAE: ARUNDINOIDEAE) IN NORTH AMERICA

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ABSTRACT

Three taxa of *Phragmites australis* have previously been reported in North America. While native *P. australis* subsp. *americanus* has been formally described, questions remain as to the subspecific status of the introduced and Gulf Coast lineages. Here we attempt to provide answers to commonly asked questions and describe a consistent nomenclature for one of these two lineages. While it has been treated previously as a variety, we recognize the Gulf Coast lineage as ***Phragmites australis* subsp. *berlandieri***. This subspecies is distributed along the southernmost border of the United States and extends its distribution south through Mexico and Central America into South America. Issues regarding the taxonomic identity of the introduced lineage are also discussed.

RESUMEN

Tres taxones de *Phragmites australis* han sido citados previamente en Norteamérica. Mientras la nativa *P. australis* subsp. *americanus* ha sido descrita formalmente, aún quedan problemas como el estatus subespecífico, de las plantas introducidas y las de la Costa del Golfo. Aquí intentamos contestar a las preguntas comunes y proponer una nomenclatura consecuente para uno de estos dos linajes. Aunque ha sido tratada como una variedad, reconocemos el linaje de la Costa del Golfo como ***Phragmites australis* subsp. *berlandieri***. Esta subespecie está distribuida por las fronteras sureñas de los Estados Unidos, extendiéndose hacia el sur por México y Centroamérica hasta Suramérica. Además se examina la identidad taxonómica del linaje introducido.

Phragmites australis (Cav.) Trin. ex Steud. is a widely distributed species found in marsh systems all over the world. In 2002, Saltonstall demonstrated that it is represented in North America by three different genetic lineages. Of these, one is native and endemic to North America, one is found in both North and South America, and one is introduced and invasive. The native endemic has been named *P. australis* subsp. *americanus* Saltonstall, P.M. Peterson & Soreng and is widespread across North America, extending from Canada to southern California, across the Midwest, and along the Atlantic Coast to North Carolina (Fig. 1a). The Gulf Coast lineage is found from the Atlantic coast of Florida, around the Gulf of Mexico, across the southernmost states to the Gulf of California and south through Mexico and Central America into South America (Fig. 1b). In 2004, Saltonstall, Peterson and Soreng stated that this taxon corresponded to *P. australis* var. *berlandieri* (Fourn.) C.F. Reed. It is not clear whether it is introduced or native to the Americas and possibly other subtropical regions. The invasive introduced lineage of *P. australis* is now widespread across North America and its distribution overlaps with both the other lineages (Fig. 1c). The use of different ranks for the lineages and confusion over how the Gulf Coast lineage relates to native and introduced *P. australis* has led to questions that we address in this manuscript.

Nomenclature of the invasive introduced lineage

Introduced *Phragmites australis* most likely originates from Europe (Saltonstall 2002). This creates a nomenclatural dilemma. The holotype of *P. australis* was collected near Port Jackson [Sydney Harbor], Australia in 1799. Clayton (1968) considered Australian and European specimens to be conspecific, but treated plants from the Mediterranean region as *P. australis* subsp. *altissimus* (Benth.) Clayton. In doing so, he automatically brought the name *P. australis* subsp. *australis* into existence. These two subspecies may be “rather imperfectly distinguished” (p. 116) by the shape of the upper glume (Clayton 1967). Tutin (1980) did not recognize any infraspecific taxa in his treatment of *Phragmites* for *Flora Europaea*. Phillips (1995) placed Ethiopian plants in *P. australis* subsp. *altissimus*, but did not state how they differed from subsp. *australis*. She described the

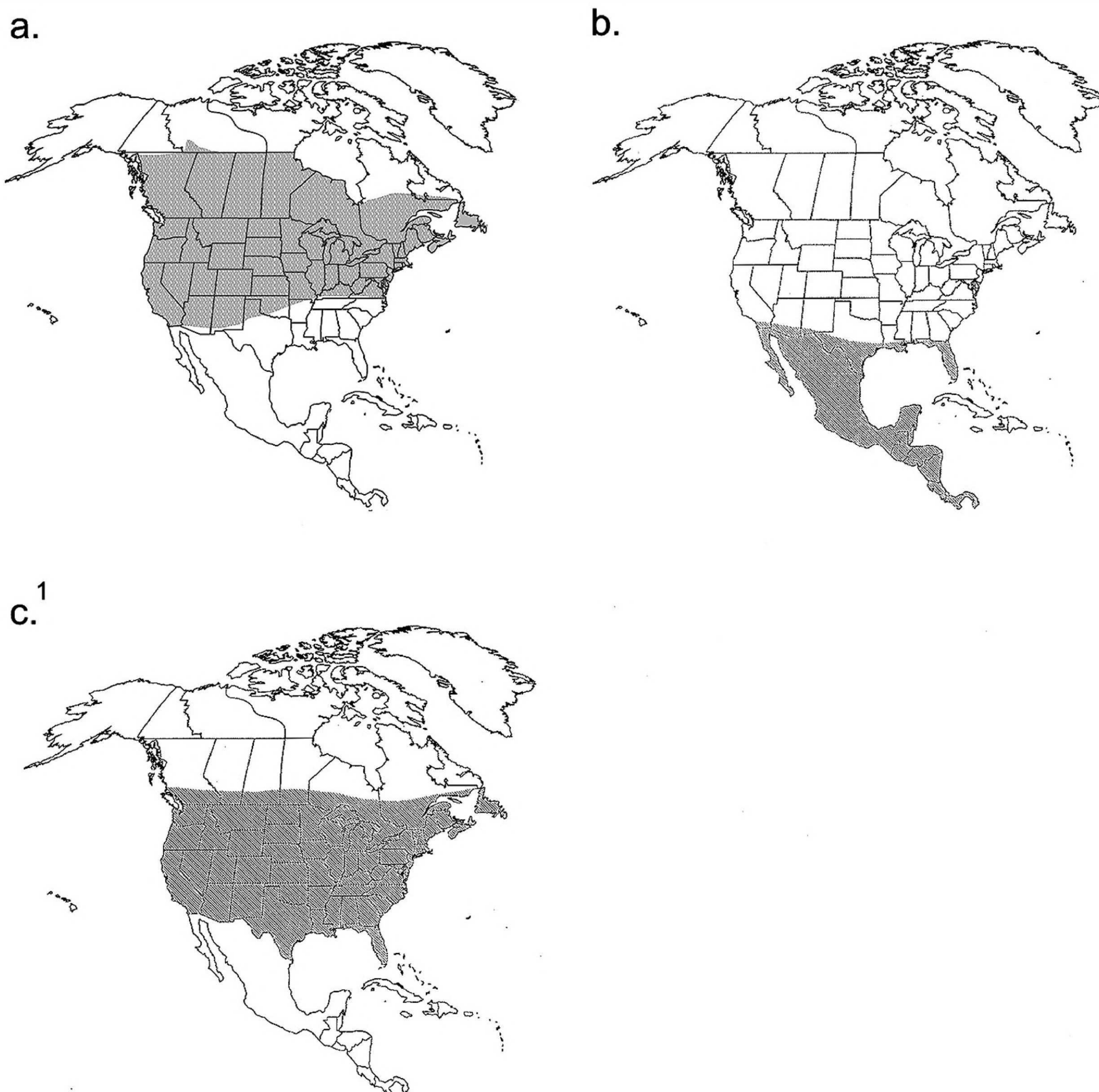


FIG. 1. Distribution of a) Native, b) Gulf Coast, and c) Introduced lineages of *Phragmites australis* in North America. Reprinted from Saltonstall et al. 2004.

plants of *P. australis* subsp. *altissimus* as having culms 3–6 m tall, leaf blades 30–60 cm long by 1–3 cm wide, and panicles 30–50 cm long. This is very similar to the description Wheeler et al. (2002) provided for plants from New South Wales, Australia: Plants to about 6 m tall, leaf blades to 50 cm long and 3.5 cm wide, panicles 15–30 cm long. Both descriptions provide additional details, but there is no evident distinction between the two.

The genetic relationship between European and Australian *P. australis* populations is poorly understood at this time. Chloroplast DNA haplotype M, which North American introduced *P. australis* possesses, is widespread across Europe and Asia. Haplotype Q, which is distinct from all haplotypes found in Europe, was found in Australia (Saltonstall 2002). Further, in a phylogeographic study of *Phragmites* using AFLPs,,

¹Although not documented across the Gulf Coast except for in the Mississippi River Delta (Saltonstall 2002), introduced *Phragmites* may already have invaded these regions and certainly has the potential to spread into them. The distribution of introduced *Phragmites* is not known south of the U.S. border and thus is not included in this figure.

Lambertini et al. (2006) recognized a distinct Australian/Asian clade within *P. australis*. The relationships of the European taxa to the Australian taxon are unclear and need further investigation. It is also not known to which of the named European taxa introduced *P. australis* belongs. Therefore, it is not possible at this time to identify the appropriate subspecific name for the introduced lineage in North America.

Nomenclature of the Gulf Coast lineage

In treating the Gulf Coast lineage as *Phragmites australis* var. *berlandieri*, Saltonstall et al. (2004) left unanswered the question as to its subspecific status. Although botanical names are never shown with more than one infraspecific rank, if both subspecific and varietal ranks are used, it is desirable to show how the taxa relate to each other. Morphologically, the Gulf Coast strain resembles the introduced lineage more than the native. It differs significantly from the introduced strain in only one of the four characters measured, lower glume length, and was intermediate between the other two lineages at most characters (Saltonstall et al. 2004). Examination of microsatellite DNA variation (Saltonstall 2003) revealed that Gulf Coast populations had unique alleles and allele phenotypes at most loci. They all share the same cpDNA haplotype I, which was also found in some South American samples and one sample from Guam, and has several mutations which distinguishes it from haplotype M (Saltonstall 2002). They also share similar isozyme profiles, which differ from those of introduced *P. australis* (Pellegrin and Hauber 1999). Clearly, they represent a taxon that is distinct from that of the invasive introduced lineage and from subsp. *americanus*. It is not as yet clear how widely the Gulf Coast taxon is represented outside the Americas.

Saltonstall et al. (2004) recognized the Gulf Coast lineage as a variety but, in retrospect, it seems better to name it a subspecies so as to reflect the equivalence of its genetic differentiation to that of subsp. *americanus*. The lineage has sometimes been called *Phragmites karka* Retz. (Jones 1997), the holotype of which was collected in India. It is possible, though not evident, that the Gulf Coast lineage belongs to that species. It seems best, therefore, to employ the same epithet for the subspecies as was earlier used at the varietal rank in Saltonstall et al. (2004). If this lineage is subsequently determined to belong to the same taxon as *P. karka*, then that name will have precedence at the species level, but will have no effect at the subspecies level since there are no subspecific names in *P. karka*. We propose a new subspecies combination for the Gulf Coast lineage below.

Phragmites australis* subsp. *berlandieri (E. Fourn.) Saltonstall & Hauber, comb. nov. BASIONYM: *Phragmites berlandieri* E. Fourn., Bull. Soc. Bot. France 24:178. 1877. *Phragmites communis* var. *berlandieri* (E. Fourn.) Fernald, Rhodora 34:211. 1932. *Phragmites maximus* var. *berlandieri* (E. Fourn.) Moldenke, Torreya 36:93. 1936. *Phragmites communis* subsp. *berlandieri* (E. Fourn.) Å. Löve & D. Löve, Bull. Torrey Bot. Club 81:33. 1954. *Phragmites australis* var. *berlandieri* (E. Fourn.) C.F. Reed, Phytologia 63:410. 1987. TYPE: U.S.A. TEXAS: entre Laredo y Bejar, Feb 1828, J.L. Berlandier 1446 (LECTOTYPE designated by Saltonstall et al. 2004: P, [see notes by Catling 2006]; ISOLECTOTYPE: US-82049 fragm. ex Pl, US-82049 fragm. ex Pitt. & Dur.! [Bruxelles]), US-82049 fragm. ex W!).

Clearly, questions remain concerning *Phragmites*, many of which require a global approach. The purpose of this paper is simply to provide a consistent nomenclature, to the extent that it is possible, for the lineages that occur in North America. The following key using morphological and genetic features is given to separate these three lineages (from Saltonstall et al. 2004).

KEY TO THE LINEAGES OF *PHRAGMITES AUSTRALIS* IN NORTH AMERICA

1. Ligules 1.0–1.7 mm long; lower glumes 3.0–6.5 mm long; upper glumes 5.5–11.0 mm long; lemmas 8.0–13.5 mm long; leaf sheaths caducous with age; culms exposed in the winter, smooth and shiny; rarely occurs in a monoculture; chloroplast DNA haplotypes A-H, S, Z, AA, AB, AC (see Saltonstall 2002, 2003) _____ ***P. australis*** subsp. ***americanus*** (Native lineage)
1. Ligules 0.4–0.9 mm long; lower glumes 2.5–5.0 mm long; upper glumes 4.5–7.5 mm long; lemmas 7.5–12.0 mm long; leaf sheaths not caducous with age; culms not exposed in the winter, smooth and shiny or ridged and not shiny; usually occurs as a monoculture; chloroplast DNA haplotypes I or M.
 2. Culms smooth and shiny; southern California, Arizona, New Mexico, Texas to Florida, throughout Mexico and Central America; chloroplast DNA haplotype I _____ ***P. australis*** subsp. ***berlandieri*** (Gulf Coast lineage)
 2. Culms ridged and not shiny; southern Canada from British Columbia to Quebec south throughout the Continental United States; chloroplast DNA haplotype M _____ ***P. australis*** (Introduced lineage)

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